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Contents

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Surveillance trends

Heat Injuries - US Army, 1998-2000

Since 1995, the Army Medical Surveillance Activity has reported periodically on the occurrence of heat injuries in the US Army. Assessments of trends, seasonality, and demographic correlates of heat injury risk may help target prevention efforts at high-risk activities, settings, and subgroups. This analysis summarizes heat injuries among active duty soldiers from 1998-2000.

Methods. All data were derived from the Defense Medical Surveillance System. Records of all hospitalizations, outpatient visits, and reportable medical events between 1998 and 2000 were searched to identify incident cases per calendar year of heat-related injuries among active duty soldiers. To estimate the "expected" numbers of cases among soldiers with various lengths of service, the total number of heat injury cases was multiplied by the proportions of soldiers in length-of-service-defined year groups.

Results. During the 3-year surveillance period, the incidence rate, severity, and sources of reports of heat injuries in the Army remained remarkably stable (table 1). During calendar year 2000, there were 953 cases of heat injury. The crude incidence rate was 2.0 per 1,000 person-years. Of these cases, 15% were diagnosed as the most severe type (i.e., heat stroke or syncope) and 14% were hospitalized.

In general, incidence rates were higher among younger (< 30 years old), enlisted, and female soldiers compared to their respective counterparts (table 2). Although the highest rate of injuries occurred among young female enlisted soldiers (3.3 per 1000 person-years), the greatest number of cases occurred among young male enlisted soldiers (n=1,749, 60.7% of the total) (table 2).

Heat injuries occurred in every month of the year; however, there was a strong correlation between season and risk (figure 1). For example, more than one-fourth of all cases occurred in July (n=760, 26.4%) and approximately two-thirds occurred in June (n=578, 20.1%), July, or August (n=611, 21.2%). Intermediate numbers of cases occurred in May (n=281, 9.8%) and September (n=284, 9.9%), but fewer than 100 cases occurred in any month from October through April (figure 1).

Interventions are often focused on subgroups or settings with the greatest numbers of excess (i.e., potentially preventable) cases. Most cases (n=879)

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IInquiries regarding content or material to be considered for publication should be directed to: Editor, Army Medical Surveillance Activity, Building T-20, Room 213 (Attn: MCHB-TS-EDM), 6900 Georgia Avenue, NW, Washington, D.C. 20307-5001. E-mail: editor@amsa.army.mil

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Table 1. Incidence rate, severity, and source of report of heat injuries - US Army, 1998-2000

Characteristics	Number of cases			Rate per 1,000 person-years		
	1998	1999	2000	1998	1999	2000
Total	1,010	918	953	2.1	2.0	2.0
Severity						
Heat stroke, syncope	144	122	142	0.3	0.3	0.3
Heat exhaustion, cramps	866	796	811	1.8	1.7	1.7
Source of report[1]						
Hospitalizations	157	140	133	0.3	0.3	0.3
Reportable events	153	150	193	0.3	0.3	0.4
Outpatient visits	700	628	627	1.5	1.4	1.3

1. Sources are mutually exclusive and are listed in order of priority.

Table 2. Number and rate of heat injuries by gender, grade, and age - US Army, 1998-2000

Characteristics	Number of cases		Rate per 1,000 person-years	
	Men	Women	Men	Women
Enlisted				
≤30 yrs	1,749	421	2.6	3.3
>30 yrs	350	108	1.1	2.1
Officer				
≤30 yrs	155	19	2.6	1.6
>30 yrs	63	10	0.4	0.5

Figure 1. Number of heat injuries by month - US Army, 1998-2000

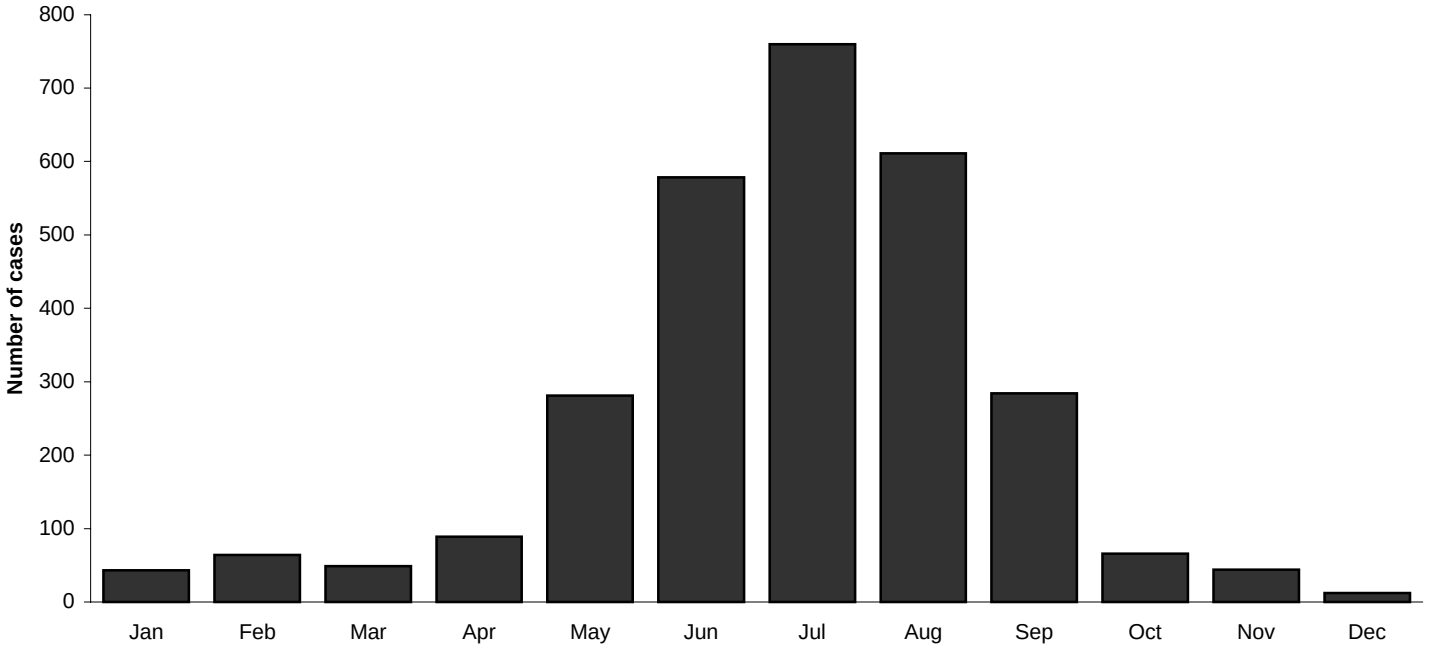


Table I. Sentinel reportable events, US Army medical treatment facilities[1] Cumulative events for all beneficiaries, calendar year through February 2000 and 2001[2]

Reporting Facility	Number of reported events[3]		Environmental				Food- and Water-borne							
			Cold		Heat		Campylobacter		Giardia		Salmonella		Shigella	
	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001
NORTH ATLANTIC RMC														
Walter Reed AMC, DC	36	36	-	-	-	-	-	-	-	1	1	-	-	1
Aberdeen Prov. Grd., MD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT Belvoir, VA	36	22	-	-	-	1	2	-	-	1	-	-	-	-
FT Bragg, NC	193	190	-	6	-	2	-	-	-	-	-	1	-	-
FT Drum, NY	38	45	9	-	-	-	-	1	-	-	-	-	-	-
FT Eustis, VA	20	36	-	-	-	-	-	-	-	-	-	-	-	-
FT Knox, KY	41	54	-	-	-	-	-	-	-	1	-	-	-	-
FT Lee, VA	34	58	-	-	-	-	-	-	-	-	-	-	-	-
FT Meade, MD	20	14	-	-	-	-	-	-	-	-	1	1	-	-
West Point, NY	6	4	-	-	-	-	-	-	-	-	-	-	-	-
GREAT PLAINS RMC														
Brooke AMC, TX	74	48	-	-	-	-	-	2	-	-	-	-	1	-
Beaumont AMC, TX	34	24	-	-	-	-	-	-	-	-	-	-	-	-
FT Carson, CO	116	134	-	-	-	-	-	-	-	-	-	1	-	1
FT Hood, TX	183	153	1	-	-	-	1	1	-	-	-	-	2	-
FT Huachuca, AZ	6	2	-	-	-	-	-	-	-	-	-	-	-	-
FT Leavenworth, KS	2	1	-	-	-	-	-	-	-	-	-	-	-	-
FT Leonard Wood, MO	28	47	3	2	-	-	-	-	-	-	-	-	-	-
FT Polk, LA	35	57	-	-	-	-	-	-	-	-	-	-	-	-
FT Riley, KS	70	19	19	-	-	-	-	-	-	-	-	-	-	-
FT Sill, OK	-	59	-	-	-	-	-	-	-	-	-	-	-	-
SOUTHEAST RMC														
Eisenhower AMC, GA	37	40	-	-	-	-	-	-	-	-	-	-	-	-
FT Benning, GA	33	88	-	-	-	-	-	-	-	-	-	2	-	-
FT Campbell, KY	48	83	2	-	-	-	-	2	2	1	-	1	-	-
FT Jackson, SC	-	42	-	-	-	-	-	-	-	-	-	-	-	-
FT Rucker, AL	14	13	-	-	-	-	-	-	-	-	-	2	-	-
FT Stewart, GA	97	97	-	-	-	-	-	-	-	-	-	1	-	-
WESTERN RMC														
Madigan AMC, WA	82	115	-	2	-	-	-	1	-	1	-	1	-	-
FT Irwin, CA	2	4	-	-	-	-	-	-	-	-	-	-	-	-
FT Wainwright, AK	2	9	1	2	-	-	-	-	-	-	-	-	-	-
OTHER LOCATIONS														
Tripler, HI	114	159	-	-	-	-	5	5	5	5	1	5	-	3
Europe	47	204	1	3	-	-	-	5	-	1	2	3	-	-
Korea	79	1	2	-	-	-	-	-	-	-	1	-	-	-
Total	**1,527**	**1,858**	**38**	**15**	**-**	**3**	**8**	**17**	**7**	**11**	**6**	**18**	**3**	**5**

1. Main and satellite clinics.

2. Events reported by March 7, 2000 and 2001.

3. Tri-Service Reportable Events, Version 1.0, July 2000. Not all reportable events are displayed in Table I. Number of events in a row may not equal the total number of reported events for the reporting facility.

Table I. (Cont'd) Sentinel reportable events, US Army medical treatment facilities[1] Cumulative events for all beneficiaries, calendar year through February 2000 and 2001[2]

Arthropod-borne				Vaccine Preventable						Sexually Transmitted							
Lyme Disease		Malaria		Hepatitis A		Hepatitis B		Varicella		Chlamydia		Gonorrhea		Syphilis[4]		Urethritis[5]	
Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001
-	-	-	-	-	-	-	-	2	1	5	10	4	4	1	2	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1	-	-	-	28	15	3	4	-	1	-	-
-	-	1	2	-	-	-	-	1	2	78	91	51	47	-	-	62	37
-	-	-	-	-	-	-	-	-	-	21	34	8	10	-	-	-	-
-	-	-	-	-	-	1	-	-	1	12	24	6	11	-	-	-	-
-	-	-	-	-	-	1	-	2	1	29	39	7	11	1	1	-	-
-	-	-	-	-	-	-	-	-	-	26	44	8	14	-	-	-	-
-	-	-	-	-	-	-	-	-	-	15	10	2	3	-	-	-	-
-	-	-	-	-	-	-	-	-	-	6	4	-	-	-	-	-	-
-	-	-	1	-	-	-	-	2	-	27	23	10	11	-	-	-	-
-	-	-	-	1	-	-	-	-	-	23	21	9	2	-	-	-	-
-	-	-	-	-	-	-	-	-	-	92	100	19	14	-	-	4	15
-	-	-	-	-	-	-	-	2	1	96	65	36	37	-	2	25	37
-	-	-	-	-	-	-	-	-	-	3	2	3	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
-	-	-	-	-	-	-	-	7	5	11	28	5	8	-	-	2	-
-	-	-	-	-	-	-	-	-	-	33	39	2	14	-	-	-	-
-	-	-	-	-	-	-	-	-	-	35	18	16	1	-	-	-	-
-	-	-	-	-	-	-	-	-	1	-	31	-	11	-	-	-	15
-	-	-	1	-	-	-	-	1	-	35	36	1	3	-	-	-	-
-	-	-	-	-	-	-	-	5	3	19	56	6	21	2	-	-	-
-	-	-	-	-	-	-	-	-	-	23	65	20	13	1	-	-	-
-	-	-	-	-	-	-	-	-	1	-	27	-	14	-	-	-	-
-	-	-	-	-	-	-	-	-	-	10	10	4	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	34	31	23	21	-	-	40	44
-	-	-	-	-	-	-	1	-	-	42	70	8	19	-	-	27	19
-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	6	-	-	-	-	-	-
-	-	-	-	1	-	1	-	-	-	65	106	11	16	-	-	-	-
-	-	-	-	-	-	-	4	3	3	34	157	4	24	-	-	-	-
-	-	-	-	-	-	1	-	1	-	63	1	2	-	6	-	-	-
-	**-**	**1**	**4**	**2**	**-**	**5**	**5**	**26**	**19**	**869**	**1,165**	**268**	**335**	**11**	**6**	**160**	**167**

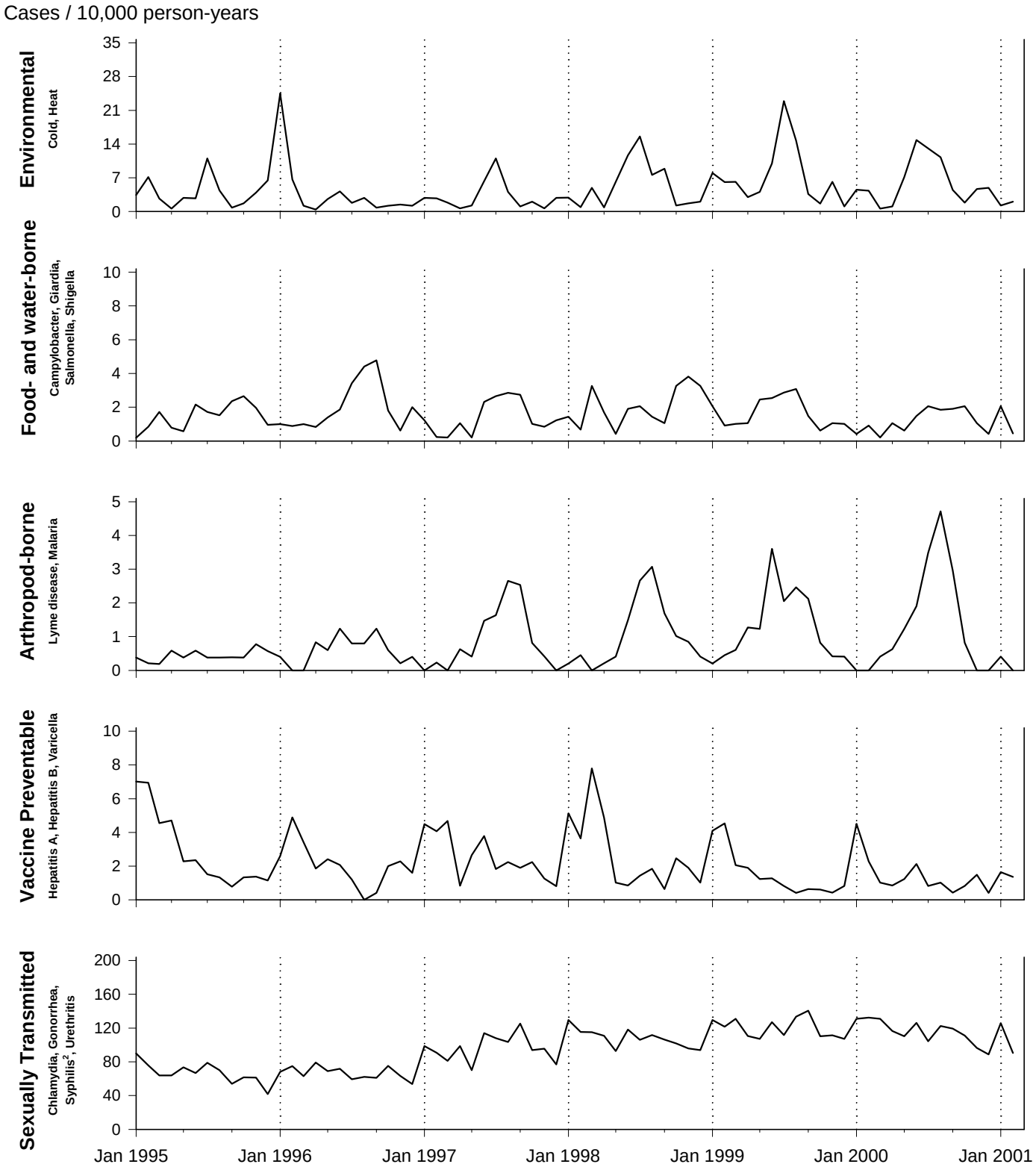
4. Primary and secondary.

5. Urethritis, non-gonococcal (NGU).

Note: Completeness and timeliness of reporting varies by facility.

Source: Army Reportable Medical Events System.

Figure I. Sentinel reportable events (grouped), active duty soldiers, January 1995 - February 2001[1]



1. Events reported by March 7, 2001
2. Primary and Secondary

Source: Army Reportable Medical Events System

Continued from page 2

of heat injury, as well as the most excess cases (n=482), occurred among soldiers with less than a year of service (figure 2). Nearly 500 cases (of which 123 were considered excess) occurred among soldiers in their second years of service. In contrast, there were generally fewer cases than expected among soldiers with 5 or more years of service (figure 2).

Editorial comment. Heat injuries remain a significant cause of morbidity and lost duty time among active duty soldiers. In recent years, soldiers in their first 2 years of service have had significantly higher rates of heat-related injuries than their more experienced counterparts. The first 2 years of service generally include basic and advanced individual training and the first permanent duty assignment. Trainees may be at particularly high risk of heat injuries, especially during summer months, if they are not acclimatized to hot, humid weather and not physically well conditioned. New arrivals at permanent duty assisgnments may be at high risk if they are not closely supervised (as they were by drill instructors) during physically demanding training or during operations in heat-stressful environments.

Heat injury prevention programs should be aggressively implemented at basic and advanced individual training centers and among new arrivals in first permanent duty assignments. While injury risks are highest in the summer months, they begin to increase in April of each year. Thus, programs should be initiated early in the spring and reinforced throughout the summer and early fall. Training of soldiers, supervisors, and commanders at all levels should emphasize Army guidelines regarding fluid replacement and work-rest cycles in heat stressful conditions.[2,3]

Analysis and report by Barbara Brynan, MPH, Analysis Group, Army Medical Surveillance Activity.

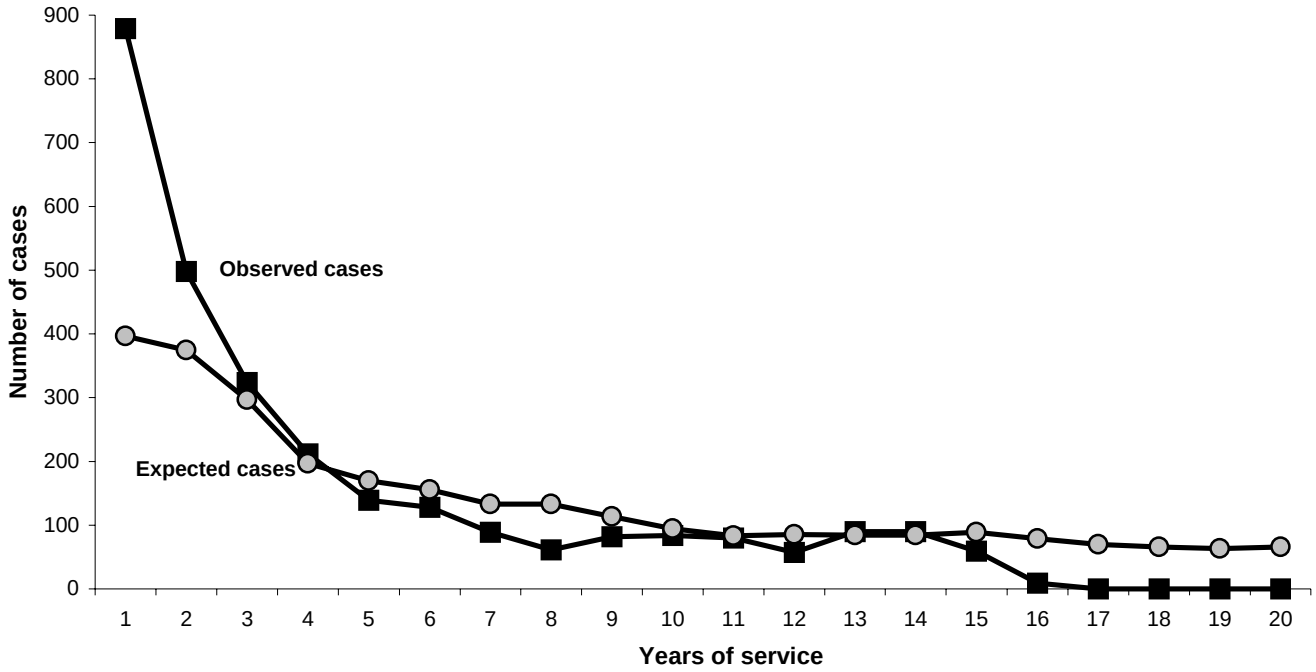
References

1. USACHPPM. Heat-related outpatient visits, active duty soldiers, US Army, January 1997–August 1998. *MSMR.* 1998;4(7):17-19.

2. Memorandum, subject: Policy guidance for fluid replacement during training, Department of the Army, Office of the Surgeon General, 29 April 1998.

3. Montain SJ, Latzka WA, Sawka MN. Fluid replacement recommendations for training in hot weather. *Mil Med.* 1999;164(7):502-8.

Figure 2. Number of excess heat injuries by year of service - US Army, 1998-2000



Note: Expected cases defined as the total number of heat injury cases multiplied by the proportion of soldiers in years-of-service defined groups.

Surveillance trends

Cutaneous Fungal Infections - US Armed Forces - 1998-1999

Cutaneous fungal infections are significant threats to the health and operational effectiveness of military forces. Risk factors for fungal skin infections include hot and humid weather, poor skin hygiene, communal living, and trauma to the skin, such as scratches and insect bites.

It is not surprising that risks of skin infections are particularly high during combat operations in tropical environments.[1] For example, among US Army forces in the Southwest Pacific in 1944-1945, skin diseases (many fungal in origin) accounted for approximately 75% of all outpatient visits, 20% of hospitalizations, and 15% of medical evacuations;[2] during the French campaign in Indochina from 1945-1954, skin diseases (of which fungal infections were most frequent) caused significant morbidity and enormous manpower losses;[3] and during the Vietnam War, skin infections caused more lost duty days among frontline combat soldiers than all other medical conditions combined.[4] However, the military medical importance of skin infections tends to be underrated during peacetime. This report examines cutaneous fungal infection diagnoses in the US Armed Forces in 1998-1999 in relation to demographic, seasonal, and geographic factors.

Method. The Defense Medical Surveillance System was searched to identify all outpatient records of active duty servicemembers during 1998-1999 with diagnoses of fungal infections of the skin and nails. For some analyses, diagnoses that were uncommon (<4.0% of all infections) or "unspecified" were grouped as "other infections."

Results. During the 2-year period, 53,057 servicemembers made 66,124 visits to military outpatient clinics for cutaneous fungal infections. The crude incidence rate was 193 per 10,000 person-years. The most common anatomic areas affected were the feet (19.1%), nails (18.3%), and body (10.2%) (table 1).

Men and women had similar rates of all diagnoses except "dermatophytosis of the groin and perianal area" which was four times more common in men (figure 1). In general, rates decreased with age (figure 1); however, rates of nail infections increased roughly 50% with each decade of age, and rates of tinea versicolor were highest among servicemembers in their twenties. Rates were generally 50 to 100% higher in summer than in winter; however, there was little seasonal variation in rates of fungal infections of the nails and feet (figure 2, see page 10).

Across 34 Army installations, rates of cutaneous fungal infections ranged from 66 to 544 per 10,000 person-years. There were no apparent relationships between geographic characteristics and fungal infection rates (figure 3, page 11). Of note, basic training posts accounted for 3 of the 4 highest installation-specific rates: Fort Knox, Kentucky (544 per 10,000 person-years), Fort Leonard Wood, Missouri (539 per 10,000 person-years), and Fort Benning, Georgia (506 per 10,000 person-years). The rates at the other two basic training installations—Fort Sill, Oklahoma (271 per 10,000 person-years) and Fort Jackson, South Carolina (140 per 10,000 person-years)—were approximately one-half and one-fourth, respectively, the rates of the highest installations.

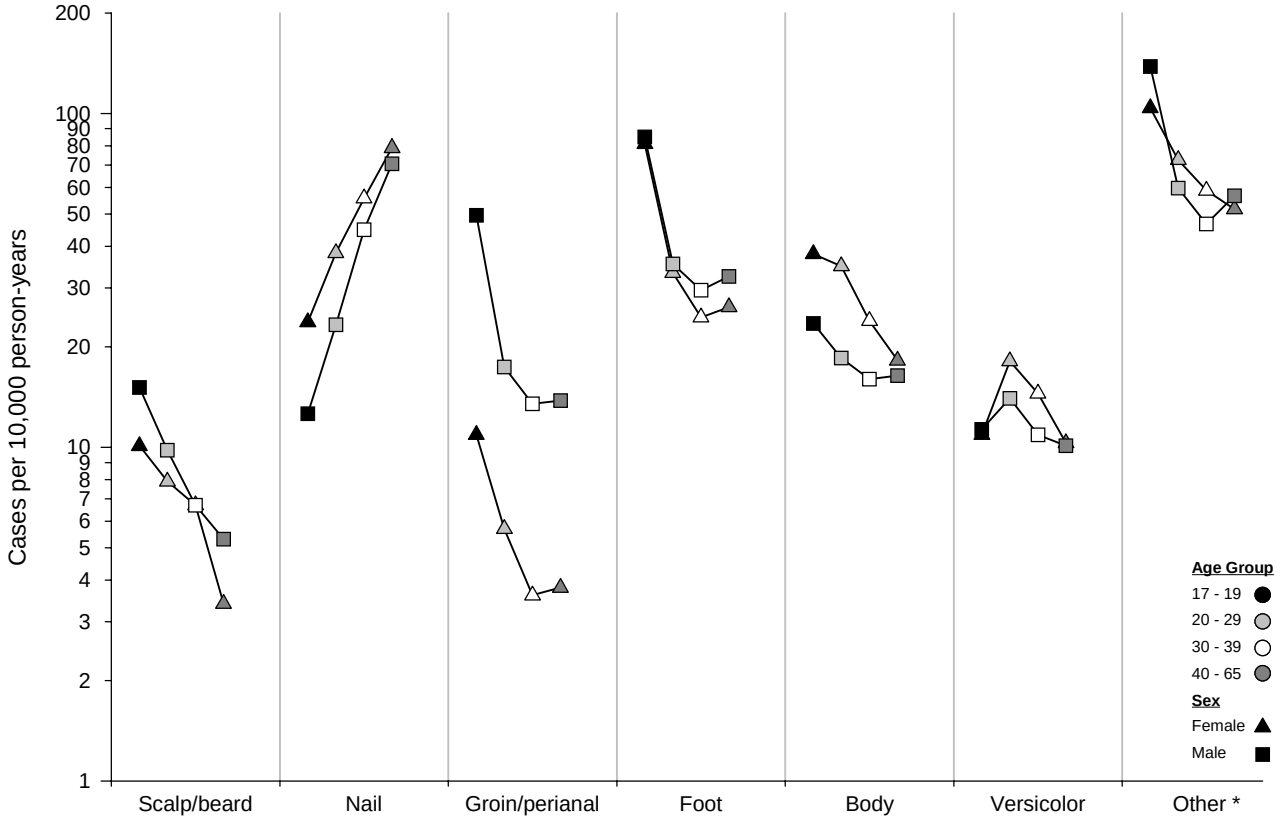
Editorial comment. This study documents that cutaneous fungal infections are common causes of ambulatory clinic visits among US servicemembers. Rates of fungal skin infections documented in this report are likely to underestimate the actual rates. For example, in many circumstances and settings, mild infections (e.g., athlete's foot, jock itch) are likely to be treated outside of fixed medical facilities—by unit medical personnel or by patients using over-the-counter medications. In addition, infections that occur during field training exercises and overseas deployments are unlikely to be documented in automated data systems. On the other hand, most diagnoses in outpatient settings are based on clinical assessments alone (without culture confirmation). A study among Air Force recruits revealed that only 32% of cultures from sites that visually appeared to be infected with fungi had

Table 1. Number of cutaneous fungal infections by type - US Armed Forces, 1998-1999

Fungal infection	ICD-9-CM	Cases	Percentage
Tinea of foot	110.4	10,159	19.1
Tinea of nail	110.1	9,720	18.3
Tinea of body	110.5	5,429	10.2
Tinea of groin and perianal area	110.3	4,561	8.6
Tinea versicolor	111.0	3,548	6.7
Tinea of scalp and beard	110.0	2,370	4.5
Other[1]			
Unspecified sites of dermatophytosis	110.9	13,953	26.3
Unspecified dermatomycoses	111.9	1,698	3.2
Other specified sites of dermatophytosis	110.8	720	1.4
Candidiasis of skin and nail	112.3	415	0.8
Tinea of hand	110.2	180	0.3
Tinea nigra	111.1	157	0.3
Tinea blanca	111.2	103	0.2
Other specified dermatomycoses	111.8	33	0.1
Deep seated dermatophytosis	110.6	6	0.0
Black piedra	111.3	5	0.0
(Other[1] subtotal)		(17,270)	(32.5)
Total		53,057	100.0

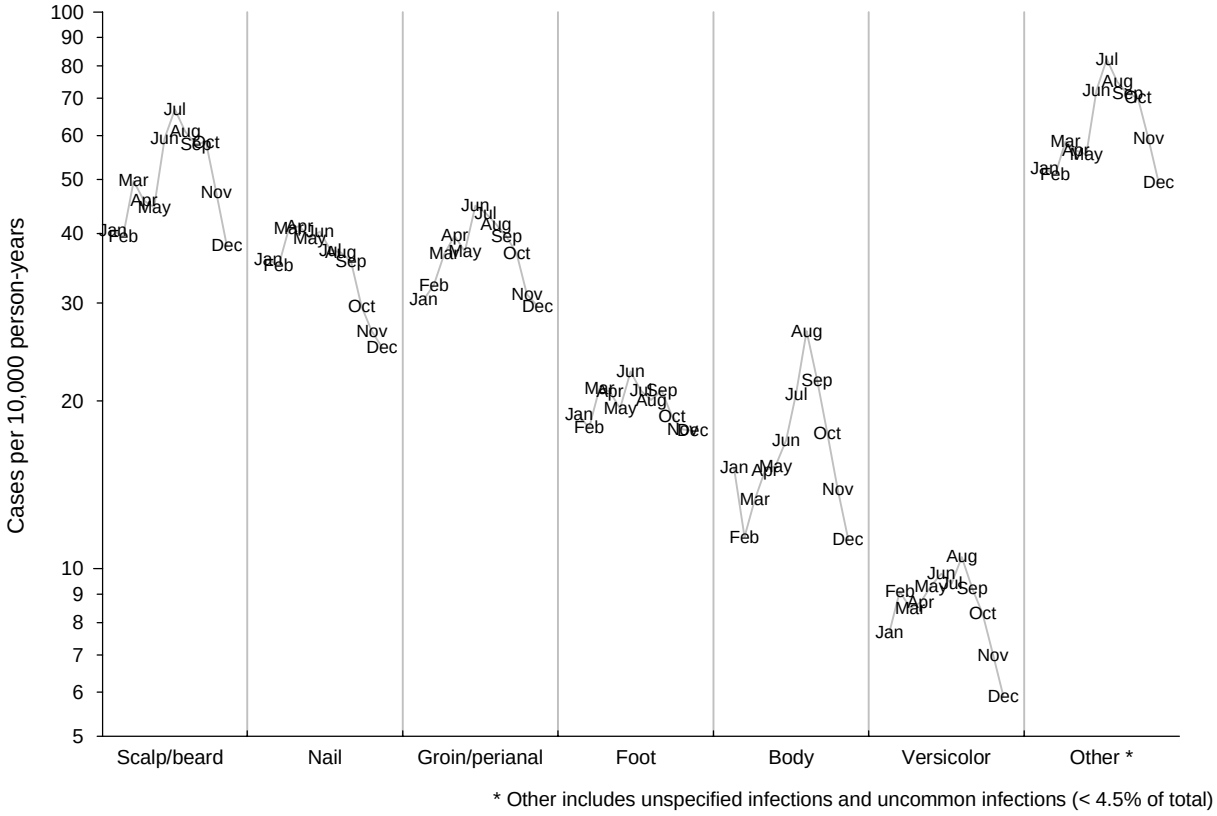
1. Other includes unspecified infections and uncommon infections (<4.5% of total).

Figure 1. Rate of cutaneous fungal infections by age, sex, and type - US Armed Forces, 1998-1999



* Other includes unspecified infections and uncommon infections (<4.5% of total)

Figure 2. Rate of cutaneous fungal infections by month and type - US Armed Forces, 1998-1999



positive cultures for dermatophytes, although 39% of positive cultures were taken from clinically normal skin.[4]

Historically, troops conducting combat operations in tropical environments have had extremely high rates of skin infections. This study reveals that in the Army during peacetime, rates of cutaneous fungal infections are relatively highest among the youngest soldiers, during the summer months, and at the infantry (Fort Benning), armor (Fort Knox), and engineer (Fort Leonard Wood) training centers. Given the historical importance of fungal skin infections during combat, clinical (e.g., diagnosis, treatment) and prevention training and research efforts should be integrated with combat arms training in hot weather.

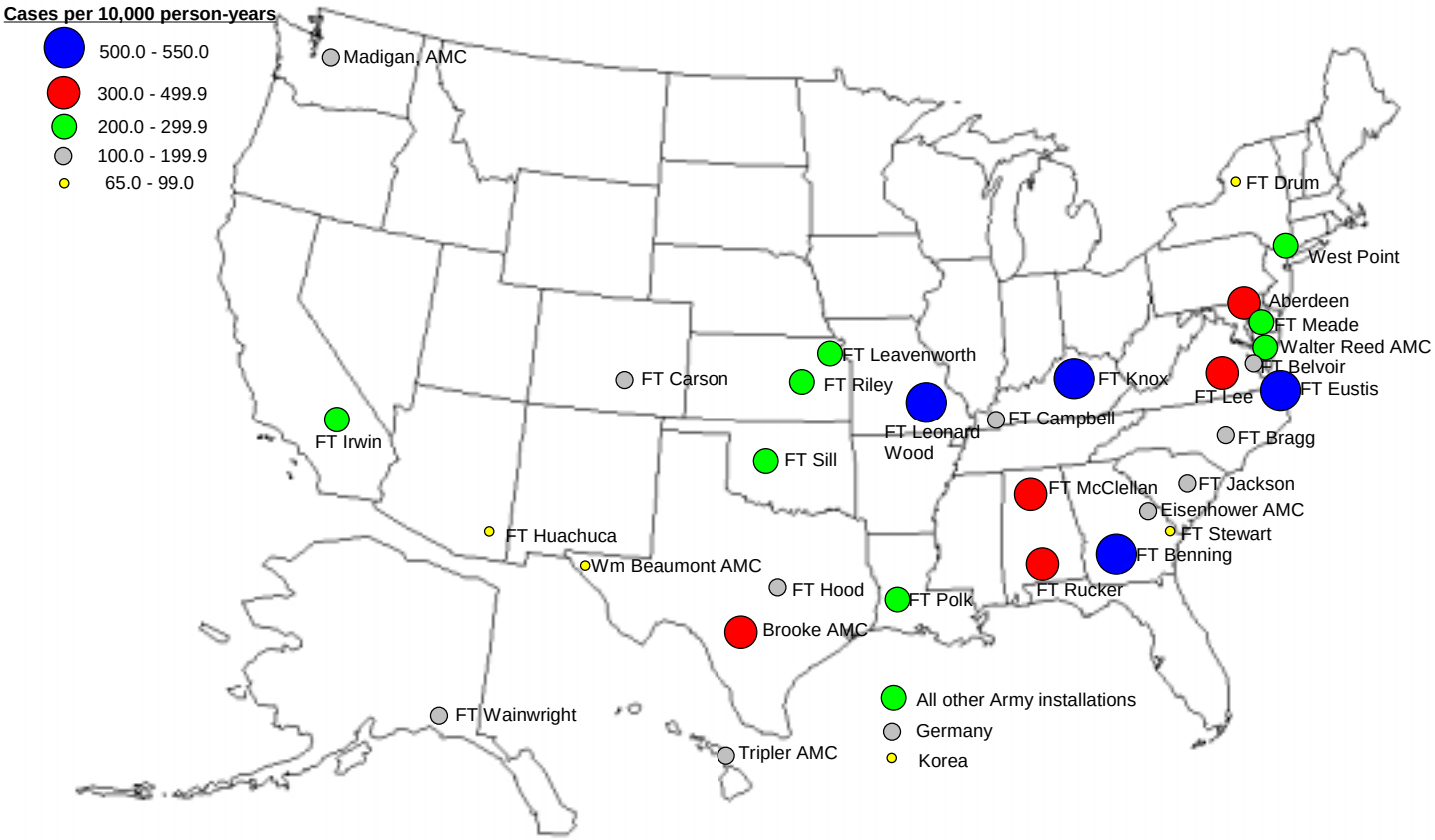
Future epidemiological studies should attempt to determine how fungal infections are transmitted, particularly in field settings. For example, studies should attempt to clarify the relative effects of sanitation (e.g., shower, gym, latrine facilities), personal hygiene (e.g., clothing, washing of skin surfaces), and other susceptibility factors (e.g., ambient temperature, insect bites). Clinical studies should define pathophysiologic mechanisms (particularly in physically and psychologically stressed subjects), rapid diagnostic approaches, and optimal treatment protocols for use in the field.

Analysis and report provided by Gabriella Andreotti, MPH, Data Analysis Group, Army Medical Surveillance Activity.

References

1. Allen AM. *Skin diseases in Vietnam, 1965-72*.Washington, DC: US Army; 1977.
2. Pillsbury DM, Livingood CS. Experiences in military dermatology. *Arch Derm Syph.* 1947;55:441-62.
3. Allen AM, Taplin D, Lowy JA, Twigg L. Skin infections in Vietnam. *Mil Med*. 1972;137(8):295-301.
4. Davis CM, Garcia RL, Riordon JP. Dermatophytes in military recruits. *Arch Derm*. 1972;105:558-60.

Figure 3. Rate of cutaneous fungal infections by installation - US Army, 1998-1999



Surveillance trends

Noise-induced Hearing Loss among Men - US Armed Forces, 1998-1999

Many hazards associated with military service can have immediate and obvious impacts on the health of servicemembers and the outcomes of missions. Although the harmful effects of noise are often delayed and insidious, [1] they are no less important. Hearing loss due to occupational noise is one of the most common injuries and the leading cause of workers' compensation claims in the military. [1,2] Whether permanent or temporary, noise-induced hearing loss can significantly degrade the health, well-being, and operational effectiveness of servicemembers.[1-4] This report describes rates of diagnoses of noise-induced hearing loss among male servicemembers of the US Armed Forces in relation to demographic characteristics, military statuses, and military occupations. (Females are not included in this report because there were few diagnoses relative to their male counterparts).

Methods. The Defense Medical Surveillance System was searched to identify incident outpatient visits with primary diagnoses of "noise-induced hearing loss" (ICD-9-CM 388.12) among male active duty military personnel from 1998-1999.

Results. During the 2-year period, there were 5,766 incident visits by male servicemembers with primary diagnoses of noise-induced hearing loss. Overall, the rate was 21.2 per 10,000 person-years (table 1). In general, rates of diagnoses of noise-induced hearing loss increased with age (table 1). Across all age groups, noise-induced hearing loss was more common among enlisted men versus officers, those in combat occupations versus medical and combat support (figure 1, page 14), and in the Navy and Marine Corps versus the Army and Air Force (table 1).

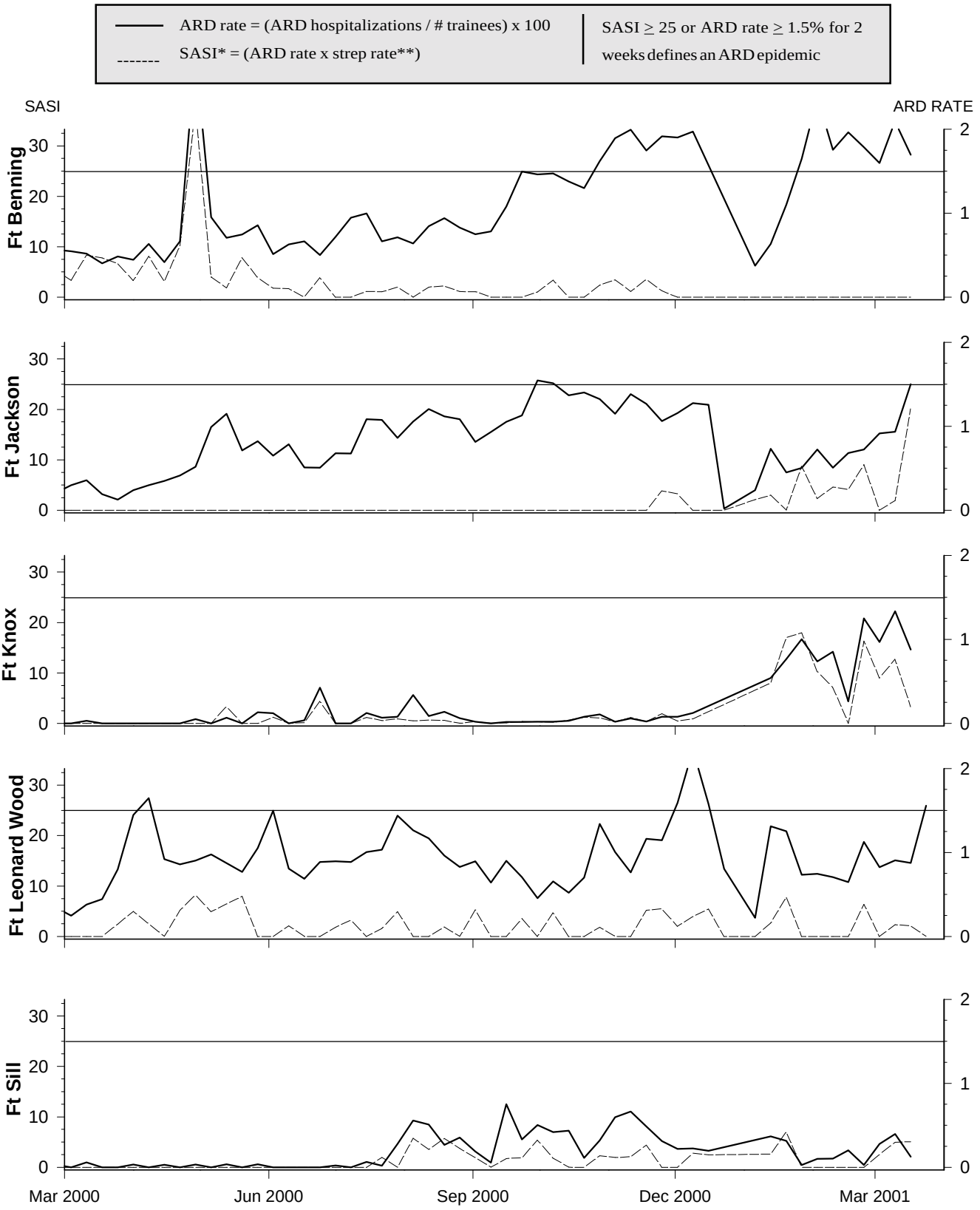
During 1998-1999, 79 of the 108 enlisted occupations accounted for 10 or more incident ambulatory visits for noise-induced hearing loss (table 2, page 15). The greatest number of visits for noise-induced hearing loss occurred among general seamen (n=453), infantrymen (n=416), aircraft technicians (n=333), and air crewmen (n=286). In com-

Table 1. Number and rate of noise-induced hearing loss among men by age, grade, occupation, and service - US Armed Forces, 1998-1999

Characteristic	Age							
	17-24		25-34		35-44		45+	
	Rate[1]	Number	Rate[1]	Number	Rate[1]	Number	Rate[1]	Number
All	19.6	2,064	15.9	1,613	28.0	1,617	60.1	472
Military status								
Enlisted	20.3	2,059	17.9	1,458	31.7	1,344	66.3	192
Officer	1.4	5	7.8	155	17.7	273	56.5	280
Occupation								
Combat	40.0	941	25.0	518	36.8	407	81.4	106
Combat Support	14.5	1,096	14.4	1,024	27.6	1,131	62.3	316
Medical	4.4	27	7.3	71	13.6	79	33.7	50
Service								
Air Force	2.0	43	7.0	194	16.7	331	33.9	79
Army	5.9	211	9.5	351	21.3	374	57.1	157
Marines	35.7	737	54.7	486	79.0	306	96.6	46
Navy	39.9	1,073	21.1	582	36.6	606	82.8	190

1. Rates are given per 10,000 person-years.

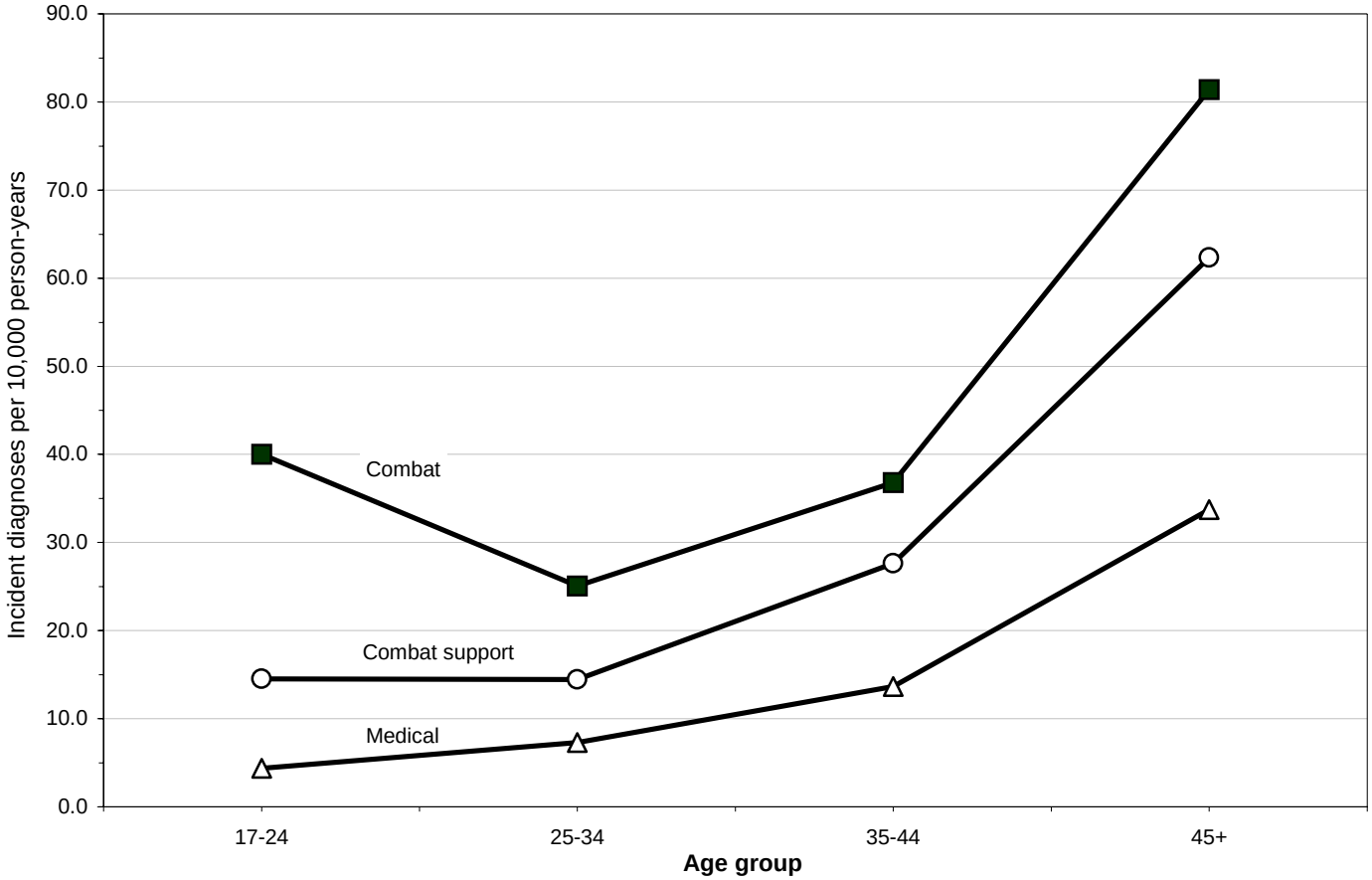
Figure II. Acute respiratory disease (ARD) surveillance update
US Army initial entry training centers



* SASI (Strep ARD Surveillance Index) is a reliable predictor of serious strep-related morbidity

** Strep rate = (Group A beta-hemolytic strep(+) / # cultures) x 100

Figure 1. Rate of noise-induced hearing loss among men by age and occupational category - US Armed Forces, 1998-1999



parison, the highest rates of hearing loss injuries were among seamen, air crewmen, and main propulsion technicians (table 2).

Editorial comment. Noise induced hearing loss is an important source of morbidity and disability among US military personnel. Hearing loss due to noise can be permanent or temporary. Temporary hearing loss is often associated with ringing in the ears, and hearing usually returns to normal within a day. Permanent hearing loss occurs after prolonged and repeated exposures to loud noises, and there are no definitive treatments.

The ICD-9-CM code 388.12, "noise-induced hearing loss," that was used for this analysis generally indicates significant threshold shifts that are confirmed after followup assessments as permanent and sensory (ICD-9-CM 389.11).[5,6] While this summary could not unequivocally distinguish between temporary and permanent hearing loss, it is likely that the higher rates of diagnoses among older servicemembers reflect permanent sensory damage from repeated acoustic traumas over years of military service.

In every age category, the highest rates of hearing loss diagnoses were in combat-related occupations (e.g., infantry, artillery, seamen). This is not surprising since, in general, the most dangerous noises related to military service are from firing weapons.[1,7] However, while seamen, infantrymen, aircraft technicians, and air crewmen accounted for the highest numbers of visits for noise-induced hearing loss, seamen, air crewmen, and main propulsion technicians had the highest rates. Clearly, many noncombat occupations also are extremely hazardous.

Our findings suggest the need for better monitoring and prevention efforts, particularly in relation to combat and other high-risk occupations.[2,4-6] Prevention measures include isolating sources of noise, controlling noise transmission, and the consistent

wear of appropriate and properly fitted ear protection (e.g., earplugs, noise muffs, sound attenuating helmets).

The Hearing Conservation Program (http://chppm-www.apgea.army.mil/dcpm/HCP/Hcp.htm) of the USACHPPM provides assistance in assessing, abating, and protecting against military-specific and other occupational noise hazards.

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Table 2. Occupations with the most cases and the highest and lowest rates of noise-induced hearing loss among men - US Armed Forces, 1998-1999

Occupation	Number of visits	Rate per 10,000 person-years
Occupations with the most cases of hearing loss		
Seamanship	453	139.0
Infantry	416	30.0
Aircraft technician	333	31.5
Air crew	286	82.9
Not occupationally qualified (includes basic trainee)	211	26.6
Main propulsion	177	61.4
Motor vehicle operator	148	36.7
Artillery and gunnery	129	40.0
Auditing and accounting	129	11.7
Automotive	120	25.7
Occupations with the highest rates of hearing loss[1]		
Seamanship	453	139.0
Air crew	286	82.9
Main propulsion	177	61.4
Undesignated occupations	25	54.1
First sergeant, sergeants major, leading chief	62	52.4
Navigator	15	46.5
Rocket artillery	29	46.2
Diver	13	41.9
Auxiliary, equipment operation, machine maintenance	95	41.7
Instructor	108	41.5
Occupations with the lowest rates of hearing loss[1]		
Firefighting	12	11.6
Communications center operations	24	11.3
Ammunition repair	22	11.3
Medical, cardiovascular, respiratory specialist	84	10.5
Signal intelligence, linguist	17	10.2
Nuclear, biological, and chemical warfare specialists	13	9.1
Infantry, gun crew, general	22	8.7
Administration, general	45	6.7
Security guard	26	5.3
Personnel, general	23	5.1

1. Excludes occupations with < 10 cases.

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